Latency and Criticality of Uncertainties in the Development of Product-Service Systems

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LATENCY AND CRITICALITY OF UNCERTAINTIES IN THE DEVELOPMENT OF PRODUCT-SERVICE SYSTEMS

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RESEARCH MOTIVATION

Servitization requires manufacturers to develop new business models - compound offerings between products and services often referred to as Product-Service Systems (PSS). The development of PSS goes beyond the traditional product-development practices, requiring new processes and capabilities due to the high levels of uncertainty caused by the novelty and complexity of developing the product and the service in parallel. Uncertainty is further increased through mostly long life cycles of PSS and organisational complexity caused by a high degree of stakeholder involvement (Wolfenstetter et al., 2015). The lack of managing these uncertainties often leads to large-scale losses for the provider, also known as the "servitization paradox". Uncertainty has been characterised by a framework in product development literature in terms of its latency and criticality (O'Connor and Rice, 2013). Latency describes whether the uncertainty may be recognizable in time and distinguishes unanticipated and anticipated uncertainties. Criticality defines the influence on the project's immediate progress and distinguishes routine (and thus foreseeable) and extraordinary (and thus unforeseeable) events. This research aims to apply this framework which stems from the product-development literature to PSS development to explore the phenomenon of uncertainty in this context

METHOD

We present a case study with a large company operating in the food and beverage industry. The case company developed a PSS comprising of hard- and software for remote condition monitoring and a complementary service bundle consisting of maintenance, monitoring, analysis and optimization of the customer's production processes. The development process required strong stakeholder management capabilities as it cut across all segments within the organization and represented a collaboration of 5 major companies. Although it was initiated in the middle of 2015 with the aim to complete it in middle of 2016, several uncertainties challenged the progress of the development leading to rescheduling the launch to the middle of 2018. The case data was collected via semi-structured interviews and evaluation of supporting project documentation. The data was analysed through coding in ATLAS.ti.

FINDINGS

In the course of the project several uncertainties for both latency categories were identified. Anticipated uncertainty was exemplified through the cultural change in moving from a traditional manufacturer towards a service-oriented company. The case company struggled with convincing the employees of the change in the business model and motivating them to actively support and engage in its implementation. An example of unanticipated uncertainty was the underestimation of the complexity of the PSS development. The degree of detail required to define new functions and

processes for the PSS execution, and align them with the existing ones. This was strongly underestimated and lead to a delay of the project. Criticality arose through routine and extraordinary uncertainty. Routine uncertainty was exemplified through the technical complexity of interface engineering between all systems. Here increased PSS complexity due to a higher number of interfaces between different software, hardware and service components had to be designed. Extraordinary uncertainty arose through quality problems with a physical component by virtue of the long life cycle prerequisite of the PSS. This resulted in a major delay of the PSS development due to fault tracing and the changeover to another hardware provider. Further examples of latency and criticality of uncertainties from the case company are shown in Figure 1.

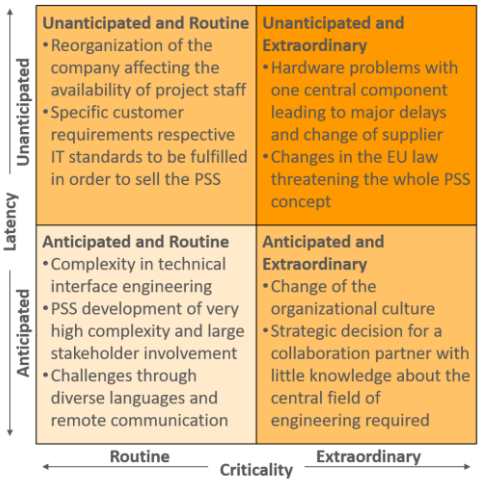

Figure 1: Uncertainty Assessment Matrix

CONTRIBUTION TO THEORY AND PRACTICE

This paper contributes to theory building through applying an uncertainty framework to PSS development. This contributes to the servitization literature by offering specific insights into the challenges occurred during PSS development. Building on a retrospective analysis further research should be conducted to aid uncertainty identification and prediction. Managerial implications are the creation of uncertainty awareness during PSS development, the ability to assess uncertainty and enable fast responses. Based on the framework managers can establish routine procedures for uncertainty management in the planning phase and respond immediately to extraordinary events.

KEY DISCUSSION POINTS

- Uncertainties in PSS development may be assessed through their latency and criticality
- Latency may be distinguished into anticipated and unanticipated uncertainties
- Criticality may differentiate routine and extraordinary uncertainties
- The case shows that in PSS development all four categories of uncertainty typically arise
- This framework enables practitioners to assess uncertainties and manage them appropriately

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